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CLAIMS

1. An acousto-optical add/drop multiplexer (10), comprising:
an acousto-optical switch (8) on a birefringent and photoelastic
5 substrate (101), the acousto optical switch including
a first optical port (202) coupled to a first polarization splitter
(104),
first acousto-optical polarization conversion region (U) including
a first optical waveguide branch (119) optically coupled between the first polarization
10 splitter and a second polarization splitter (110),
second acousto-optical polarization conversion region (L)
including a second optical waveguide branch (120) optically coupled between the first
polarization splitter and the second polarization splitter, and
second and third optical ports (203, 205) coupled to the second
15 polarization splitter;
a first circulator (7) having, in order of rotation, an input port (7a), a
switch port (7b) coupled to the first optical port, and an output port (7c);
a reflecting device (13) coupled to the second optical port.
2. The acousto-optical add/drop multiplexer of claim 1, further comprising
20 a second circulator (12) having, in order of rotation, a filter port (12a) coupled to the
third optical port, a drop port (12b), and an add port (12c).
3. The acousto-optical add/drop multiplexer of claim 1, wherein the first
25 polarization splitter has cross and bar transmission respectively for orthogonal
polarization components of received light.
4. The acousto-optical add/drop multiplexer of claim 1, further comprising:
a first transducer (123) within the acousto-optical switch acoustically
30 coupled to the first polarization conversion region and to an RF source (6), the first
transducer generating a first acoustic wave in the first polarization conversion region
having a characteristic frequency determined by the RF source.
5. The acousto-optical add/drop multiplexer of claim 4, further comprising:
35 a second transducer (124) within the acousto-optical switch
acoustically coupled to the second polarization conversion region and to the RF

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source, the second transducer generating a second acoustic wave in the second polarization conversion region having the characteristic frequency with a propagation direction opposite to a propagation direction of the first acoustic wave.

5 6. The acousto-optical add/drop multiplexer of claim 1, wherein the reflecting device is coupled to the second optical port via an optical fiber.

10 7. The acousto-optical add/drop multiplexer of claim 1, wherein the reflecting device is integrated on the substrate at the second optical port.

15 8. The acousto-optical add/drop multiplexer of claim 7, wherein an edge of the substrate at the second and third optical ports is slant-polished and an optical waveguide (106) coupled to the second optical port within the substrate is positioned substantially normal to the edge. *A*

20 9. The acousto-optical add/drop multiplexer of claim 1, further comprising:
a polarization-mode-dispersion compensator (9a) coupled between the reflecting device and the second optical port.

25 10. The acousto-optical add/drop multiplexer of claim 9, wherein the polarization-mode-dispersion compensator is a birefringent element.

30 11. The acousto-optical add/drop multiplexer of claim 10, wherein the birefringent element is one of a polarization-maintaining fiber and a birefringent crystal.

35 12. The acousto-optical add/drop multiplexer of claim 9, wherein the polarization-mode-dispersion compensator is one of a Faraday rotator and a quarter-wave plate.

 13. The acousto-optical add/drop multiplexer of claim 2, further comprising:
a first polarization-mode-dispersion compensator (9a) coupled between the filter port of the second circulator and the third optical port of the switch;
and

 a second polarization-mode-dispersion compensator (9b) coupled between the switch port of the first circulator and the first optical port of the switch.

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14. The acousto-optical add/drop multiplexer of claim 2, further comprising
a second acousto-optical switch (8') formed on the same substrate as
the acousto-optical switch, including
5 a fourth optical port (203') coupled to the drop port of the second
circulator,
third and fourth polarization conversion regions (U, L) optically coupled
between third and fourth optical polarization splitters, and
a fifth optical port (204) coupled to the fourth optical splitter.
- 10 15. The acousto-optical add/drop multiplexer of claim 14, further
comprising
a third acousto-optical switch (8'') formed on the same substrate as the
acousto-optical switch, including
15 a sixth optical port (205'') coupled to the add port of the second
circulator,
fifth and sixth polarization conversion regions (U, L) coupled
between fifth and sixth optical polarization splitters, and
a seventh optical port (202'') coupled to the fifth optical splitter.
- 20 16. A wavelength selective optical cross-connect, comprising:
at least two acousto-optical switches (8, 8'), each including, on a
birefringent and photoelastic substrate
25 a first polarization splitter,
a wavelength-selective polarization conversion stage (U, L)
including first and second optical waveguide branches coupled between the first
polarization splitter and a second polarization splitter,
a reflecting device (13, 13') coupled to one arm of the second
polarization splitter, and
30 a circulator (7, 7') having, in order of rotation, an input port (7a,
7a') for receiving line channels, a switch port (7b, 7b') coupled to the first polarization
splitter, and an output port (7c, 7c') ; and
an optical path coupling second arms of the second polarization
splitters in the respective acousto-optical switches.
- 35 17. The wavelength selective optical cross-connect of claim 16, wherein

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the two acousto-optical switches each have only one optical port connected to the first polarization splitter.

18. An acousto-optical waveguide device (8) selective in wavelength,
5 comprising:
a birefringent and photoelastic substrate (101);
a wavelength-selective polarization conversion region (108) including
first and second acoustic waveguides (121, 122) and first and second optical paths
(119, 120);
10 a first polarization splitter (104) coupled between one end of the first
and second optical paths and only a first optical interface (202) for the device; and
a second polarization splitter (105) having
input arms (114, 113) coupled to an opposite end of the first
and second optical paths
15 a first output arm (118) coupled to a second optical interface
(205) for the device and a second output arm (117),
a reflecting device (13) coupled to said second output arm.

19. A method of multiplexing optical channels, comprising the steps of:
20 providing a line optical channel at a first wavelength to an acousto-
optical switch (8) having a first polarization splitter (104) and a polarization conversion
stage (108) connected between the first polarization splitter and a second polarization
splitter (105);
switching said line optical channel to a first arm (117) of the second
25 polarization splitter;
reflecting said line optical channel back through the switch via the first
arm;
adding to a second arm (118) of the second polarization splitter a new
channel at a wavelength different from said first wavelength; and
30 combining the new channel and the line optical channel at an output of
the switch (202) coupled to the first polarization splitter.

20. The method of claim 19, wherein the adding step includes the
substep of:
35 separating said new channel from a different plurality of optical
channels in another acousto-optical switch.

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21. A method of dropping optical channels, comprising the steps of:
providing a plurality of optical channels to an acousto-optical switch (6)
having a first polarization splitter (104) and a polarization conversion stage (108)
5 connected between the first polarization splitter and a second polarization splitter
(105);

- switching at least one of the optical channels to a first arm (118) of the
second polarization splitter and other of the optical channels to a second arm (117) of
the second polarization splitter;
10 reflecting the other of the optical channels back through the switch via
the second arm;
dropping said at least one of the optical channels from said first arm of
the second polarization splitter.

- 15 22. The method of claim 21, wherein the dropping step
includes the substep of:
passing the at least one of the optical channels to another acousto-
optical switch for addition to a different plurality of optical channels.

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